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Infantile Paralysis.

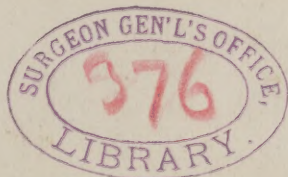
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[This paper was designed to be read before the Clinico-Pathological Society of the District of Columbia, but is published in advance on account of the adjournment of that body over the summer months.]

In presenting this paper on "infantile paralysis," I shall endeavor to show the frequent connection of the affection with some irritation preceding it; that it depends upon some organic lesion of the medulla spinalis, and shall speak of the treatment which is likely to prove most beneficial.

On May 15, 1873, I was called to see a little boy of German parentage, who had completed his first year and was evidently suffering from dentition. I found a pretty well nourished child, with a hot skin, accelerated pulse, extreme restlessness, a disposition to throw his head backward and to put his hands in the mouth. The bowels were confined. His mother informed me that he had been in this condition for two days. The symptoms were of sufficient gravity to indicate to me the existence of a cerebro-spinal irritation. Ordered an enema, cold applications to the head, a warm foot bath and a dose of magnesia. On my next visit, May 17, there was an amelioration of symptoms, the bowels had

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been moved, the skin was less hot, and the child suffered evidently less from head symptoms. Ordered a mixture of Spt. Mindererus and nitre, and cold to the head continued. I considered, at the time, the propriety of lancing the gums, but my opinion being unsettled in regard to it, it was left undone. Next day, May 18, was pleased to detect the eruption of the first upper molar tooth. The child appeared to be comfortable, nursed and slept well. The mother, however, called my attention to the perfectly motionless appearance of the lower extremities, which she had discovered only since morning. The child, who had been previously able to walk with assistance, was now unable to move its legs; in fact there was paralysis of motion from the knees downward. Sensibility in the limbs was intact, indeed there seemed to be, so far as I was capable of judging, a condition bordering on hyperesthesia. According to the statement of the mother there had been no convulsion during the night. She believed however firmly that the palsy had come on during the night and remembered well the activity of his limbs at previous bathing. I informed the family of the true condition and gave a very guarded prognosis, suggesting that immediate treatment was hardly called for and that unless other symptoms arose, I should call in a week and institute a proper treatment; in the meanwhile, enjoined good hygiene.

I need hardly state, that as a young physician, I was completely at a loss to know what to do for a paralysis with a history as above described. I felt satisfied that this was not a case of so-called essential or functional paralysis, and yet the paralysis corresponded to the description of the affection given in the books. In reading Vogel's description I was disappointed in his views regarding the pathology, but was pleased with the treatment suggested, namely the cold douche, afterwards wrapping up the limbs warmly, and passive motion. This treatment I recommended at my next visit, and it was faithfully carried out twice a day. I made a spinal examination of the little patient, but it was impossible for me to assert whether there was or was not, spinal tenderness

at any particular point. The bladder and rectum were unaffected; the child, with the exception of the paralysis, enjoyed good health at this time. After ten days' treatment I observed a decided change in the sensibility of the limbs; frictions of the towel no longer seemed to produce pain; the hyperesthetic condition had disappeared. The treatment was continued in the following order: friction with flannel saturated in whisky in the morning, cold douche at midday, shampooing the limbs, with passive motion in the evening. The spirituous friction and shampooing were omitted every alternate day and the simple douche employed instead. These means always produced a decided reaction and kept up the nutrition of the parts remarkably well. About the fifth or sixth week of the affection there was a perceptible change in the strength of the right leg and evidence of a gradual return of the power of motion in some individual muscles.

At this time I was anxious to know whether the muscles responded to the electric current, and to test the efficacy of electricity. On July 15th I employed both the interrupted and continued current, and found, much to my regret, that none of the muscles of the left leg responded to the test, and only a few, particularly the tibialis anticus of the right leg, responded at all. The application seemed to cause pain, still I continued my efforts, and applied electricity about eight times in the space of two weeks. I observed no improvement, no increased response of the muscles to the current; on the contrary, it caused evidently great pain, and therefore I concluded to discontinue it and to resort to it only again in case of a more marked atrophy of the muscles of the left limb. There seemed in reality to be a slight difference in size at this time. The temperature, however, was good and the circulation quite active.

The local applications above spoken of were faithfully applied, and about August 20, I noticed a considerable improvement in the right leg and a slight improvement in the left. The little fellow seemed quite proud of his right leg, and would extend or hold it up to me on occasional visits. Dur-

ing this month he had a severe attack of infantile diarrhea, which was the accompaniment of the eruption of the molar tooth on the lower maxilla. From September the improvement in both limbs was continuous; he could stand on the right leg and attempted to walk, though with a decided dragging motion of the left. On Christmas he walked with the assistance of his mother about the chairs, and in February, 1874, the family had the satisfaction of seeing him walk unaided. This was nine months after the first manifestations of the affection. I may state that atrophy of the muscles was never decided, and that now he seems to have regained without any deformity, the power of motion in every muscle. There is a *slight paresis* still perceptible in the left leg, but I entertain no doubt that the muscles will regain the same tonicity as those of the right limb.

The etiology of the affection seems to be involved in much obscurity. Meigs and Pepper (1) inform us that the "paralysis occurs when the spinal system is extremely impressible, the causes which induce it are trivial and usually entirely overlooked." The early observers attributed the affection solely to dental irritation. West (2) believes exposure to cold can often be traced as the only cause. Trousseau (3) believes paralysis in children to be frequently developed after a convulsion. Vogel (4) tells us, that most frequently it comes on during the eruption of the molar teeth, and becomes extremely rare after the completion of dentition.

Twenty-seven cases out of the forty-three tabulated by West occurred between the ages of eight months and three years, consequently during the process of dentition. The affection has been developed during febrile attacks and exanthemata, and seems to have stricken down infants in previous good health. The statistics and opinions of these authors fully justify us in assuming, that in the large major-

(1). Diseases of Children, 1870.

(2). Diseases of Children, 1860.

(3). Clinical Medicine, 2 Vol.

(4). Diseases of Children, American Edition of 1871.

ity of cases of "infantile paralysis" dental irritation or some other irritation plays no small role in the production of the affection, and while I am not *too* willing to hold the teeth responsible for any disease which may arise during their evolution, I am driven to the conviction that the irritation from a tooth is in many cases sufficient to produce mischief. I well remember the pain I suffered during the eruption of the last molar tooth, and Dr. Seguin I think treats this point entirely too lightly in his paper on "infantile spinal paralysis." (1).

We are willing to admit diseases of Pregnancy, why can we not with the same propriety admit diseases peculiar to infants during the process of dentition?

In the case reported there was unquestionably an irritation more fierce in character than belonged to the physiological process of dentition. How much the constipated condition of the bowels or a predisposition of the system had to do with the development of the affection I am unable to say; It is however interesting to know, that the little patient suffered less previously and subsequently from teething, and that during these periods the bowels were either open, or there was a diarrheal attack.

As to the pathology of the affection the weight of evidence is *now* in favor of the fact, that the so-called Essential (1) Functional or Infantile Palsies, are due to some central lesion. Careful examinations with the scalpel and microscope have shown quite satisfactorily the existence of inflammatory products and other changes in the spinal column, circumscribed or diffused, as the case may have been.

In order to make myself more clearly understood I will endeavor to describe the lesion as I believe it to have occurred in the case reported. It is my opinion, that the eruption of the molar tooth caused a cerebro-spinal irritation, that this irritation was transmitted to some point in the medulla spinalis, and there resulted probably in the lumbar re-

(1). Medical Record, January 15, 1874, p. 25.

gion a circumscribed inflammation of the anterior column of the cord.

I reason in this from analogy. Is not the supposition just as plausible as the fact, that the irritation from an extensive burn should cause inflammation and ulceration of Bruner's glands in the intestine? What known connection does there exist between the two surfaces excepting a nervous one? And how else can we explain a convulsion induced by worms or crude ingesta in the alimentary canal, than by reflex irritation? And does not a convulsion always indicate too a hyperemic condition of the anterior column of the cord? Hence the perverted function is the result of a perverted irritation.

Eulenburg quotes the experiments of *Lewisson* (1) who, by strong irritation of the cutaneous nerves of a frog, suspended motor power, not only in the irritated limb but in the others, and considers this a proof that the centripetal irritation of sensitive nerves is sufficient to arrest the functions of the nerve centres. I believe, therefore, in the possibility of the original irritation lighting up some mischief elsewhere, in this case in the situation indicated above.

In what the first change in the lesion consisted I am unable to say, because our knowledge of cell-life and cell-nutrition is not very elaborate, but I conjecture, that the irritation primarily interfered with the physico-chemical changes in the nerve cells and their function, and that secondarily a congestion and circumscribed inflammatory process resulted.

The alteration must have been very circumscribed indeed; or else we would be at a loss to account for a paralysis affecting only the lower limbs, but the fact, that *each individual nervous filament has a distinct origin and distribution and acts independently of the rest throughout its entire length, and does not communicate its irritation to those which are in proximity with it* (2) enables us fully to appreciate such a condition, and even cases where isolated muscles are concerned.

(1). *Lehrbuch*, p. 428, quotes *Archiv*, *Reichert*, and *Du Bois-Reymond*, 1869.

(2). *Dalton's Human Physiology*, 2nd edition, p. 391.

The congestion produces soon changes in the affected *spots*, and proliferation of connective tissue elements (sclerosis) is the result. This condition interferes still more with the function of the ganglionic cells and nerve tubules, and leads to their compression and partial atrophy. In some cases the inflammation gradually subsides, leaving however the inflammatory products behind; in other cases a perfect resolution may take place.

I may be asked how I can explain the recovery in cases in which these changes have actually taken place. To this I cannot give a satisfactory answer, but it does appear from Professor Roth's case, that a return of function can take place in spite of the presence of an increased amount of connective tissue and partial atrophy of the ganglionic cells. (This case is reported in Virchow's Archiv, 1873, also in the Philadelphia Medical Times, February 14, 1874, p. 311.)

Radcliffe (1) holds, that the lesion does not advance beyond the stage of congestion: this may be true in all cases that recover, though I can hardly conceive of a congestion, which has lasted for months without at *the time producing* some alteration in the tissue concerned.

Those cases, however, of short duration in which the affection disappeared as suddenly as it appeared, I believe to have depended upon congestion alone.

In making these statements, I shall be met with the question how to reconcile my argument with the writings of such men as Underwood, Rilliet et Barthez, Valleix, Kennedy, West, Bierbaum, Vogel, Ketli, Politzer, Elisher, Barnell, Braun and Adams, who consider the affection as "essential paralysis," because on post mortem examinations no lesion in the spinal canal could be discerned.

So far as I know, *six negative autopsies* have been reported, on the result of which some of these gentlemen have based their opinion, viz:

Two cases by Rilliet et Barthez. Gazette Medicale de Paris, 1850, p. 681.

(1). On Diseases of the Spinal Column and of the Nerves.

ONE case by Adams in his treatise on club-foot ;

ONE case by Bouchut in the *Union Medicale*, 1867 ;

TWO cases by Elisher quoted by Ketli in the *Jahrbuch fur Kinderkrankheiten*, 1873.

Of the first three cases we are told that no microscopic examinations were made. It is therefore fair to assume, that the gentlemen, with the exception of Bouchut and Ketli, based their opinion on gross post mortem appearances, and that only the cases of the two latter gentlemen deserve any consideration. How much the skillful use of the microscope has done and will do towards unraveling the vexed question of the pathology of infantile paralysis, and other nervous affections, can be estimated from the beautiful researches of J. Lockhart Clarke, who has shown that positive structural changes in both nerve-cells and nerve-fibrils may be detected by microscopic examinations, which were not apparent to the naked eye. I also refer to similar researches into the pathology of tetanus, chorea and hydrophobia.

Before I refer to the autopsies of cases which will in a measure sustain my position, it will be well to state, that I have excluded cases of hemiplegia, and peripheral paralysis, by which are designated paralyzes due to compression of a nerve trunk ; and to call your notice first to autopsies in which lesions either traumatic or otherwise, have been discovered in the cord. The following five cases however only prove, that pressure exercised upon the spinal marrow does produce paralysis ; and are by no means therefore typical cases of infantile paralysis.

1. *Panum* in 1856 observed embolism of some of the spinal arteries as a cause of paralysis. (*Panum Weber den Tod durch Emboli*, 1856.)

2. *VON RECKLINHAUSEN* reports a case of paralysis of both legs, in which he observed a tubercular deposit in the cord. (*Deutsche Klinik*, Jan. 31, 1863.)

3. *DR. WM. A. HAMMOND* reports a case of paralysis of left leg of four years' standing, in which an encysted clot in the anterior column of the lower part of the dorsal region was de-

tected. (Journal of Psychological Medicine, 1867, p. 51).

4. DR. CLIFFORD ALLBUTT reports a case of a child seven months old, which was lifted up rather roughly by the mother, fell forward heavily in her arms and a few minutes later was paralyzed in its four limbs ; death occurred by paralysis of respiration. The autopsy revealed two hemorrhagic clots in the cervical spinal cord. (Lancet, 1870, II. p. 84).

5. HAYEM quoted by Mrs. Jacobi speaks of a person 24 years old, who had been paralyzed when two years old ; an infiltrated hemorrhage in the lumbar cord was detected.

The following twenty-one cases are highly interesting and prove, each and all, that the paralysis must have depended upon the central lesion found upon careful examination, and that the lesion was doubtless the result of an inflammatory process.*

[Editorial Note.—Owing to the size of the table, we are obliged to substitute for it the following summary, which presents the main points designed by the author to be illustrated by it.

Of the twenty-one cases, only four were above two years of age when attacked, and none of those four were above seven years.

Eleven died at or under 5 years of age, two between 6 and 10 years, and seven between 18 and 78.

The paralysis affected both legs in 8 cases, the right leg in 3, the left leg in 2, all the limbs in 2, the right side in 1, the left arm in 2 ; one case not defined.

Atrophy of the cord was found in 14 cases, seated mostly in the lateral or antero-lateral columns, sclerosis in several of these and in 4 other cases, and congestion, meningitis and myelitis in the three remaining cases respectively. In most cases other lesions than those named were superadded, such

*The cases in question were published by Dr. E. C. Seguin, in the New York Medical Record for January 15th, 1874, and by Dr. Mary Putman Jacobi, in the American Journal of Obstetrics, for May, 1875. I hereby acknowledge my indebtedness for the knowledge of some of the cases, to their papers.

as myelitis, meningitis, congestion, granular degeneration and softening.

Nothing is said of the condition of the muscles in 7 cases. In 6 cases there was fatty degeneration and in 8 the fibres were small and also fatty in a number of instances.]

To Von Heine, who in 1840, published his *Observations on paralytic conditions of the lower extremities and their treatment*, is due the credit of first tracing the preponderating lesion to the gray matter of the spinal column, and this is confirmed by Laborde, Cornil, Prevost, Vulpian, Clark, Charcot, Joffray and Damaschino. According to these observers, the anterior columns of the cord seem smaller and there is an atrophy or entire disappearance of some of the groups of the largest ganglionic cells.

The three cases reported by M. M. Roger et Damaschino in an excellent paper to the Biological Society of Paris, at the meeting of October 7th, 1871, and published in the *Gazette Medicale de Paris*, December, 1871, well merit attention. Their paper concludes with the following four propositions:

1. The alteration peculiar to infantile paralysis is a lesion of the spinal marrow, which causes the atrophy of muscles and nerves.

2. The seat of the lesion is the anterior part of the gray substance of the mēdulla, where softened portions of the spinal substance are seen.

3. This softening is of an inflammatory nature, in fact simple myelitis.

4. Infantile paralysis should therefore be called spinal paralysis of children, and be classed among the affections of the spinal marrow, as depending on myelitis.

Dr. Carl Westphal (*vide American Journal of Medical Sciences*, April, 1874, p. 532) has recently reported two cases of paralysis in adults, in which he demonstrated the existence of myelitis occurring disseminated or in patches, (*fleckneisse*), a name by which he intends to designate diseases of the cord, where the myelitis process is spread irregularly over a large extent, so that sections made

at different heights show different diseased portions of white and gray substance, with here and there healthy parts intervening.

If this condition can be true in the adult and if, in the language of Dr. Seguin, "there is no essential difference between infants and adults in the nature, course and treatment of disease," we have another proof in addition to the twenty-one autopsies, for recognizing in infantile paralysis an affection to be traced to a central lesion.

From the foregoing it will be seen, that I regard the muscular atrophy as secondary to the central lesion, that in fact this is nothing more than the natural consequence, unless prevented by measures which are calculated to keep up the proper nutrition of the parts, and I consider therefore the name *paralysis myogenique* as given to the affection by Bouchut, hardly an appropriate one.

In regard to the treatment, I shall endeavor to show that electricity is not the *sine qua non* in the treatment of infantile paralysis, and that in the vast number of cases it is more productive of evil than of good.

This may seem strange, but let us see whether reasoning will not bear me out. Above all I should call attention to the fact that West, in his statistics, gives the number of cases cured, as 11 out of 43, not a very gratifying result. The application of electricity is intended, so far as I understand it, to induce contractions of the muscles, and to prevent a fatty degeneration and atrophy of the parts concerned. While I grant that it is admirably calculated to do this, in cases where the central lesion no longer exists, I fear that in those cases in which a subacute inflammation still remains, it does harm. Physiology teaches, "*that an irritation applied to the skin is communicated to the muscles. The irritation first passes upwards, along the sensitive fibres of the posterior root, to the gray matter of the cord, and is then reflected back along the motor fibres of the anterior root, until it finally reaches the muscles and produces a contraction.*" (1).

(1). Dalton's Human Physiology, second edition, p. 393.

This I believe holds true of the irritation applied by the electric current. Now in the vast majority of infantile paralyzes, sensation is intact, but the power of motion lost. In applying electricity therefore, the irritation is transmitted to the posterior root and gray matter of the cord, but here no longer is converted into a motor impulse, because the conducting power is interfered with.

But what does it do when so arrested? The old and true saying, "*ubi stimulus ibi affluxus*," is as applicable here as elsewhere. The irritation, instead of being transmitted and inducing muscular contractions, is bound to expend itself in the part which offers the obstacles, and an increased flow of blood is the answer of the muscular part to the irritation. I believe, therefore, that electricity, so long as the slightest inflammation is present, is eminently calculated to do harm, and that in the many cases unsuccessfully treated by this agent, this was the case. I do not desire to be understood as discountenancing the use of electricity altogether, but I do aver that in those cases only in which the inflammatory process has subsided, and the muscles are yet at fault, can electricity be productive of good results. I resorted to electricity in the case reported, but the pain it produced, led me to conclude that it was used at an improper period of the affection, and that if persevered in, it would result in harm, for I considered the pain to depend upon a hyperemia of the posterior column of the cord, induced, perhaps, during the application of the remedy, for as I have stated before, the actual hyperesthesia observed in this case only lasted about ten days.

If I was called upon to treat a similar case I should lance the gums, and resort to the administration of bromide of potassium or ergot. If the paralysis became manifest, I should apply counter-irritation to the spine, particularly over the suspected seat. Other measures, looking to the head, skin, bowels and kidneys, I should adopt according to the indications. I should endeavor to keep up the nutrition of the limbs by the local applications spoken of, and I feel sure

from the experience of the case, that an atrophic condition of the muscles is hardly possible if these measures are faithfully carried out. Surely these applications are calculated from the very start to keep up an active circulation, and the muscles will be found in a proper condition to respond to the impulse after the subsidence of the inflammation and re-establishment of the functions of the motor nerves, without resorting to the use of electricity, which by accomplishing the one does so at the expense of the other and more important lesion.

The cases of infantile paralysis reported as cured by the use of electricity I fully credit, but am inclined to regard them as cases in which, after the lesion in the spinal cord no longer existed, the condition of the muscles concerned was such as not to admit of contraction, and the electricity and the local use of strychnia remedied the latter evil and thus established the cure.

PERSONAL.

DR. GEORGE M. KOBER, U. S. A., is ordered from Alcatraz to Camp McDermitt, Nev. Dr. S. A. Storrow, U. S. A., takes the position at Alcatraz. Our readers will be pleased with Dr. Kober's paper on infantile paralysis, contained in the present number of the JOURNAL. The subject has awakened much inquiry of late and is ably handled in the essay in question.

